

WHAT IS CLAIMED IS:

1. An apparatus for polishing surfaces of objects comprising:
 - a polishing pad having a polishing surface;
 - 5 a plurality of object carriers, said object carriers being configured to secure said objects to be polished; and
 - 10 a carrier transfer assembly that is configured to sequentially transfer each of said object carriers to different positions on said polishing pad to polish said objects exclusively on said polishing surface of said polishing pad, said carrier transfer assembly being further configured to independently move each of said object carriers such that a first object can be polished by a first object carrier of said object carriers and a second object can be loaded onto a second object carrier of said object carriers in a substantially parallel manner.
2. The apparatus of claim 1 further comprising a first object transport device that sequentially transports said objects to said object carriers when said object carriers are transferred to a first location that is associated with a first position of said different positions.
3. The apparatus of claim 2 wherein said first object transport device is configured to sequentially transport said objects from said object carriers when said object carriers are situated at said first location.
4. The apparatus of claim 2 wherein said first location laterally coincides with said first position of said different positions.
- 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320 325 330 335 340 345 350 355 360 365 370 375 380 385 390 395 400 405 410 415 420 425 430 435 440 445 450 455 460 465 470 475 480 485 490 495 500 505 510 515 520 525 530 535 540 545 550 555 560 565 570 575 580 585 590 595 600 605 610 615 620 625 630 635 640 645 650 655 660 665 670 675 680 685 690 695 700 705 710 715 720 725 730 735 740 745 750 755 760 765 770 775 780 785 790 795 800 805 810 815 820 825 830 835 840 845 850 855 860 865 870 875 880 885 890 895 900 905 910 915 920 925 930 935 940 945 950 955 960 965 970 975 980 985 990 995 1000 1005 1010 1015 1020 1025 1030 1035 1040 1045 1050 1055 1060 1065 1070 1075 1080 1085 1090 1095 1100 1105 1110 1115 1120 1125 1130 1135 1140 1145 1150 1155 1160 1165 1170 1175 1180 1185 1190 1195 1200 1205 1210 1215 1220 1225 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6. The apparatus of claim 5 wherein said second location laterally coincides with said second position of said different positions.

7. The apparatus of claim 1 further comprising a first object transfer station that is situated adjacent to said polishing pad to transfer said objects to said object carriers for polishing.

8. The apparatus of claim 7 wherein said first object transfer station includes a thickness detection device to measure the thickness of said objects.

9. The apparatus of claim 7 further comprising a second object transfer station that is situated adjacent to said polishing pad, said second object transfer station providing a place to transfer said objects from said object carriers after said objects have been polished.

10. The apparatus of claim 9 wherein said second object transfer station includes a thickness detection device to measure the thickness of said objects after said objects have been polished.

11. The apparatus of claim 1 wherein said polishing pad is a rotatable polishing pad, and wherein said object carriers are configured to be selectively separated from said carrier transfer assembly, said object carriers being transferred to said different positions by said rotatable polishing pad when said object carriers are separated from said carrier transfer assembly and placed on said polishing pad.

12. The apparatus of claim 11 further comprising an aligning device that is positioned adjacent to said polishing pad such that said aligning device can contact one of said object carriers to align that object carrier to a desired position of said different positions.

13. The apparatus of claim 1 further comprising a pad conditioner connected to a curved arm, said curved arm being pivotable about an axis such that said pad conditioner sweeps said polishing pad when said curved arm is pivoted.

5 14. The apparatus of claim 1 wherein said polishing pad is configured to be rotated about a rotational axis, and wherein said carrier transfer assembly is configured to rotate said object carriers about a central axis to transfer said object carriers to said different positions.

10 15. The apparatus of claim 14 wherein said polishing pad and said carrier transfer assembly are situated such that said rotational axis is aligned with said central axis.

15 16. The apparatus of claim 14 wherein said polishing pad and said carrier transfer assembly are situated such that said rotational axis is not aligned with said central axis.

17. The apparatus of claim 1 wherein said polishing pad is configured to be rotated about a rotational axis that differs from an axis that intersects the center of said polishing pad.

20 18. The apparatus of claim 1 wherein said polishing pad is a polishing belt having a predefined width, said polishing belt being configured to be moved in a direction substantially perpendicular to said predefined width.

25 19. The apparatus of claim 18 wherein said predefined width of said polishing belt is sufficiently wide to accommodate said object carriers such that all of said object carriers can be placed on a polishing surface of said polishing belt.

30 20. The apparatus of claim 18 wherein said different positions are misaligned on said polishing pad with respect to said direction of said polishing pad.

21. The apparatus of claim 1 wherein said carrier transfer assembly is configured to radially move each of said object carriers independently.

22. The apparatus of claim 1 wherein said carrier transfer assembly is configured to move each of said object carriers independently in a lateral direction, said lateral direction being substantially perpendicular to a radial direction of said polishing pad.

5 23. An apparatus for polishing surfaces of objects comprising:

10 a polishing belt of a predefined width having a polishing surface;

a plurality of object carriers, said object carriers being configured to secure said objects to be polished; and

15 a carrier transfer assembly that is configured to sequentially transfer each of said object carriers to different positions on said polishing belt to polish said objects on said polishing surface of said polishing belt.

20 24. The apparatus of claim 23 further comprising a first object transport device that sequentially transports said objects to said object carriers when said object carriers are transferred to a first location that is associated with a first position of said different positions.

25 25. The apparatus of claim 24 wherein said first object transport device is configured to sequentially transport said objects from said object carriers when said object carriers are situated at said first location.

26. The apparatus of claim 24 wherein said first location laterally coincides with said first position of said different positions on said polishing belt.

27. The apparatus of claim 24 further comprising a second object transport device that sequentially transports said objects from said object carriers when said object carriers are transferred to a second location that is associated with a second position of said different positions.

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28. The apparatus of claim 27 wherein said second location laterally coincides with said second position of said different positions on said polishing belt.

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29. The apparatus of claim 23 further comprising a first object transfer station that is situated adjacent to said polishing belt to transfer said objects to said object carriers for polishing.

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30. The apparatus of claim 29 wherein said object transfer station includes a thickness detection device to measure the thickness of said objects.

31. The apparatus of claim 29 further comprising a second object transfer station that is situated adjacent to said polishing belt, said second object transfer station providing a place to transfer said objects from said object carriers after said objects have been polished.

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32. The apparatus of claim 31 wherein said object transfer station includes a thickness detection device to measure the thickness of said objects after said objects have been polished.

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33. The apparatus of claim 23 wherein said predefined width of said polishing belt is sufficiently wide to accommodate said object carriers such that all of said object carriers can be placed on said polishing surface of said polishing belt.

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34. The apparatus of claim 23 further comprising a rotatable polishing pad that is situated adjacent to said polishing belt, and wherein said carrier transfer assembly is further configured to sequentially transfer said object carriers to said rotatable polishing pad.

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35. The apparatus of claim 23 wherein said different positions are misaligned with respect to said direction of said polishing pad.

36. The apparatus of claim 23 wherein said carrier transfer assembly is
10 configured to radially move each of said object carriers independently.

37. The apparatus of claim 23 wherein said carrier transfer assembly is configured to move each of said object carriers independently in a lateral direction, said lateral direction being substantially perpendicular to a radial direction of said polishing pad.

38. An apparatus for polishing surfaces of objects comprising:

a polishing pad having a polishing surface;
a plurality of object carriers, said object carriers being configured to secure said objects to be polished; and
a plurality of carrier shafts that are configured to be attached to said object carriers, said carrier shafts and said object carriers being further configured to be selectively separated such that said object carriers when separated can be transferred to different positions on said polishing pad by the rotation of said
25 polishing pad.

39. The apparatus of claim 38 further comprising an aligning device that is positioned on the periphery of said polishing pad such that said aligning device can contact one of said object carriers to align that object to a desired position of said
30 different positions.

40. The apparatus of claim 38 further comprising a plurality of carrier mechanisms coupled to said carrier shafts, said carrier mechanisms being configured to radially move each of said object carriers independently when said object carriers are attached to said carrier shafts.

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41. A method of polishing surfaces of objects comprising:

loading a first object onto a first object carrier;

transferring said first object carrier to a first polishing position on a polishing pad;

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polishing said first object at said first polishing position;

loading a second object onto a second object carrier while said first object is approximately positioned at said first polishing position; and

transferring said first object carrier and said second object carriers to different polishing positions on said polishing pad such that said first and second objects are exclusively polished on said polishing pad.

42. The method of claim 41 wherein said step of loading said first object onto said first object carrier includes loading said first object onto said first object carrier situated at an object-transport location that coincides with one of said different polishing positions.

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43. The method of claim 42 further comprising a step of polishing a prior object secured on said first object carrier at said object transport location, said step of polishing said prior object and said step of loading said first object onto said first object carrier being executed without transferring said first object carrier to a different polishing position.

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44. The method of claim 43 further comprising a step of unloading said first object from said first object carrier when said first object carrier is transferred back to said object-transport location.

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45. The method of claim 42 further comprising a step of unloading a polished object from said first object carrier at a second object-transport location that is associated with a second polishing position of said different polishing positions.

5 46. The method of claim 41 wherein said step of transferring said first object carrier and said second object carrier includes rotating said polishing pad about a rotational axis with said first object carrier and said second object carrier on said polishing pad to transfer said first and second object carriers to said different polishing positions on said polishing pad.

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47. The method of claim 46 further comprising a step of extending a stopping device into a rotational path of said first object carrier and said second object carrier on said polishing pad to align said first object carrier and said second object carrier at specified positions of said different polishing positions.

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48. The method of claim 41 further comprising a step of conditioning said polishing pad with a pad conditioner on a curved arm, said curved arm being pivotable about an axis to sweep said polishing surface of said polishing pad with said pad conditioner.

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49. The method of claim 41 wherein said step of transferring said first object carrier and said second object carrier includes rotating said first object carrier and said second object carrier about a central axis, said central axis being aligned to a rotational axis of said polishing pad.

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50. The method of claim 41 wherein said step of transferring said first carrier and said second object carrier includes rotating said first object carrier and said second object carrier about a central axis, said central axis being not aligned to a rotational axis of said polishing pad.

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51. The method of claim 41 wherein said step of polishing said first object include rotating said polishing pad about a rotational axis that differs from an axis that intersects the center of said polishing pad.

5 52. The method of claim 41 wherein said step of polishing said first object includes moving said polishing pad in a linear direction.

10 53. The method of claim 41 further comprising a step of measuring the thickness of said first object before and after said first object is polished.

54. The method of claim 53 further comprising a step of adjusting polishing parameters in response to said step of measuring the thickness of said first object.

55. The method of claim 41 further comprising a step of polishing said first object as said first object carrier is transferred to said different polishing positions.

56. The method of claim 41 further comprising a step of radially moving each of said first object carrier and said second object carrier independently.

57. The method of claim 41 further comprising a step of moving each of said first object carrier and said second object carrier independently in a lateral direction, said lateral direction being substantially perpendicular to a radial direction of said polishing pad.